

§ 89.405-96 Recorded information.

(a) The information described in this section must be recorded, where applicable, for each test.

(b) *Engine description and specification.* A copy of the information specified in this paragraph must accompany each engine sent to the Administrator for compliance testing. The manufacturer need not record the information specified in this paragraph for each test if the information, with the exception of paragraphs (b)(3) and (b)(9) of this section, is included in the manufacturer's application for certification.

- (1) Engine-system combination.
- (2) Engine identification numbers.
- (3) Number of hours of operation accumulated on engine.
- (4) Rated maximum horsepower and torque.
- (5) Maximum horsepower and torque speeds.
- (6) Engine displacement.
- (7) Governed speed.
- (8) Idle rpm.
- (9) Fuel consumption at maximum power and torque.
- (10) Maximum air flow.
- (11) Air inlet restriction.
- (12) Exhaust pipe diameter(s).
- (13) Maximum exhaust system backpressure.
- (c) *Test data; general.*
 - (1) Engine-system combination.
 - (2) Engine identification number.
 - (3) Instrument operator.
 - (4) Engine operator.
 - (5) Number of hours of operation accumulated on the engine prior to beginning the warm-up portion of the test.
 - (6) Fuel identification.
 - (7) Date of most recent analytical assembly calibration.
 - (8) All pertinent instrument information such as tuning, gain, serial numbers, detector number, and calibration curve numbers. As long as this information is available for inspection by the Administrator, it may be summarized by system number or analyzer identification numbers.
- (d) *Test data; pre-test.*
 - (1) Date and time of day.
 - (2) Test number.
 - (3) Barometric pressure, pre-test segment.

(4) Engine intake humidity, pre-test segment for compression-ignition engines with non-conditioned air supply systems.

(5) Maximum observed torque for intermediate and rated speeds.

(6) Recorder chart or equivalent. Identify for each test segment zero traces for each range used, and span traces for each range used.

(7) Air temperature after and pressure drop across the charge air cooler (if applicable) at maximum observed torque and rated speed.

(e) *Test data; modal.*

(1) Recorder chart or equivalent. Identify for each test mode the emission concentration traces and the associated analyzer range(s). The start and finish of each test.

(2) Observed engine torque.

(3) Observed engine rpm.

(4) Record engine torque and engine rpm continuously with a chart recorder or equivalent recording device.

(5) Intake air flow and depression for each mode.

(6) Engine intake air temperature for each mode.

(7) Mass fuel flow for each mode.

(8) Engine intake humidity.

(9) Coolant temperature outlet.

(10) Engine fuel inlet temperature, location to be representative of in-use as specified by each manufacturer.

(f) *Test data; post-test.*

(1) Recorder chart or equivalent. Identify the zero traces for each range used and the span traces for each range used. Identify hangup check, if performed.

(2) Total number of hours of operation accumulated on the engine.

(3) Barometric pressure, post-test segment.

(4) Engine intake humidity, post-test segment for compression-ignition engines with non-conditioned air supply systems.

§ 89.406-96 Pre-test procedures.

(a) Allow a minimum of 30 minutes warmup in the standby or operating mode prior to spanning the analyzers.

(b) Replace or clean the filter elements and then vacuum leak check the system per § 89.316-96(a). A pressure leak check is also permitted per § 89.316-96(b). Allow the heated sample

line, filters, and pumps to reach operating temperature.

(c) Perform the following system checks:

(1) Check the sample-line temperature (see § 86.310-79 of this chapter for raw test procedures or § 86.1310-90 of this chapter for dilute test procedures).

(2) Check that the system response time has been accounted for prior to sample collection data recording.

(3) A hang-up check is permitted, but is optional.

(d) Check analyzer zero and span at a minimum before and after each test. Further, check analyzer zero and span any time a range change is made or at the maximum demonstrated time span for stability for each analyzer used.

(e) Check system flow rates and pressures.

§ 89.407-96 Engine dynamometer test run.

(a) Measure and record the temperature of the air supplied to the engine, the fuel temperature at the pump inlet, and the observed barometric pressure.

(b) The governor and fuel system shall have been adjusted to provide engine performance at the levels reported in the application for certification required under § 89.115-96.

(c) The following steps are taken for each test:

(1) Install instrumentation and sample probes as required.

(2) Perform the pre-test procedure as specified in § 89.406-96.

(3) Read and record the general test data as specified in § 89.405-96(c).

(4) Start cooling system.

(5) Precondition (warm up) the engine in the following manner:

(i) Operate the engine at idle for 2 to 3 minutes;

(ii) Operate the engine at approximately 50 percent power at the peak torque speed for 5 to 7 minutes;

(iii) Operate the engine at rated speed and maximum horsepower for 25 to 30 minutes;

(iv) Optional. It is permitted to precondition the engine at rated speed and maximum horsepower until the oil and water temperatures are stabilized. The temperatures are defined as stabilized if they are maintained within ± 2 °C for 2 minutes. The engine must be oper-

ated a minimum of 10 minutes for this option. This optional procedure may be substituted for the procedure in paragraph (c)(5)(iii) of this section;

(v) Optional. If the engine has been operating on service accumulation for a minimum of 40 minutes, the service accumulation may be substituted for the procedure in paragraphs (c)(5)(i) through (iii) of this section.

(6) Read and record all pre-test data specified in § 89.405-96(d).

(7) Start the test cycle (see § 89.410-96) within 20 minutes of the end of the warmup. (See paragraph (c)(13) of this section.)

(8) During the first mode calculate the torque corresponding to 75, 50, and 10 percent of the maximum observed torque for the rated speed.

(9) During the fifth mode calculate the torque corresponding to 75 and 50 percent of the maximum observed torque for the intermediate speed.

(10) Record all modal data specified in § 89.405-96(e) during a minimum of the last 60 seconds of each mode.

(11) Record the analyzer(s) response to the exhaust gas during the a minimum of the last 60 seconds of each mode.

(12) Test modes may be repeated, as long as the engine is preconditioned by running the previous mode.

(13) If a delay of more than 20 minutes occurs between the end of one mode and the beginning of another mode, the test is void. If the delay is under four hours, the test may be restarted without preconditioning (begin at the point in the procedure described at paragraph (c)(6) of this section). If the delay exceeds 4 hours, the test shall include preconditioning (begin at paragraph (c)(2) of this section).

(14) The engine speed and torque must be measured within the accuracy requirements of Table 3 (in appendix A to subpart D), and maintained within the requirements of Table 1 (in appendix B to this subpart) during a minimum of the last 60 seconds of each mode.

(15) If at any time during a test mode, the test equipment malfunctions or the specifications in paragraph (c)(14) of this section are not met, the test mode is void and may be aborted.